

# **LEGAL OPPORTUNITIES AND CHALLENGES AFFECTING NANOTECHNOLOGY RESEARCH AND COMMERCIALIZATION**

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## **Abstract**

This presentation examines the impact of law (statutes, regulations, court actions, and public policy) on nanotechnology research and development of commercial applications based on that research, and it offers suggestions to nanotechnology professionals as to how they can influence that legal impact in ways that will facilitate nanotechnology research and commercialization. The presentation concludes that a diverse range of laws significantly affect the rate and scope of nanotechnology research and commercialization of that research. Regulatory law, commercial law, and intellectual property law significantly affect nanotechnology research and the development of effective business models and commercial opportunities for the fruits of that research. Law asserts this important impact on nanotechnology research and development in both direct and indirect ways. It directly encourages or impedes nanotechnology research and it indirectly affects nanotechnology development by affecting the financial and business environment in which research and commercialization take place. As a result of the significant potential impact of law on nanotechnology research and commercialization, scientists, engineers, and other nanotechnology professionals should become familiar with the ways in which law affects nanotechnology development and use. They should also attempt to influence the legal system to promote expanded nanotechnology research and commercialization.

## **LAW AND NANOTECHNOLOGY**

Several different forms of law have a significant impact on research involving nanotechnology and the development of commercial applications based on that research. The most significant of those legal categories affecting work involving nanotechnology are: regulatory (administrative) law, commercial law, and intellectual property law. Regulatory law affects the scope of nanotechnology research. It also affects the commercial use of nanotechnology. For example, environmental protection standards and workplace safety requirements affect the form and scope of certain nanotechnology applications involving materials and manufacturing.

Commercial law includes the law of contracts, commercial transactions (sales), and financing (including equity investments). These legal requirements are essential to the creation and operation of enterprises to conduct nanotechnology research and to develop commercial nanotechnology applications. This category of law governs the business and financial transactions and structures that provide the funding and other resources necessary for nanotechnology research and commercial development. For example, law governing securities and financial investments has a significant impact on the availability of capital to support new ventures based on nanotechnology.

Intellectual property law, particularly patent law and the law of trade secrets, plays a critical role in the conduct of nanotechnology research and the rights of access and use associated with the output of that research. Intellectual property rights provide an important incentive for financial investment in research and development. They can also provide a formidable potential barrier to innovation and refinement of prior research in nanotechnology. Those two sometimes conflicting forces associated with intellectual property must be effectively balanced.

## **SCOPE OF LEGAL IMPACT ON NANOTECHNOLOGY DEVELOPMENT AND BUSINESS MODELS**

Law has both a direct impact on nanotechnology research and commercialization and an indirect impact. Law has a direct impact on nanotechnology research and commercialization to the extent that it encourages funding for research and commercialization efforts (e.g., the National Nanotechnology Initiative in the United States). By supporting, or potentially blocking, specific fields of nanotechnology research and commercialization, the law has a direct impact on the direction, scope, and rate of nanotechnology development.

Law can also influence nanotechnology development in indirect ways. For example, broad enforcement of intellectual property rights can provide great incentive for investment and research, but can also impede subsequent commercial development and continuing innovation. Commercial law dramatically affects the business transactions and organizations essential to effective research and commercial development involving nanotechnology.

## **LAW: A CRITICAL FACTOR IN NANOTECHNOLOGY RESEARCH AND COMMERCIALIZATION**

Law plays a critical role in the scope of nanotechnology research, the range of commercial applications for that research, and the pace at which commercial applications based on nanotechnology develop. Law exerts this significant influence on nanotechnology development both directly (e.g., through promotion or restriction of specific fields of research or specific applications) and indirectly (e.g., through enforcement of intellectual property rights associated with nanotechnology). Law substantially affects the scope of nanotechnology research, the range and form of applications for the fruits of that research, and the financial environment available to support both research and development of commercial applications. It is, accordingly, not an overstatement to assert that law is a critical factor in the expansion of nanotechnology research and the prompt development of commercial applications for that research.

## **LAW AND NANOTECHNOLOGY PROFESSIONALS**

As law has a significant impact on nanotechnology research and commercialization, scientists, engineers, and other nanotechnology professionals should actively monitor and influence the development and application of law in the context of nanotechnology research and commercialization. They should focus attention on both the legal initiatives that address directly nanotechnology research and development and those that influence nanotechnology development indirectly by affecting the financial and operational environment in which that research and development takes place. Nanotechnology professionals should strive to understand the range of legal issues and doctrines that affect nanotechnology research and use. In addition, they should become involved in the policy debate associated with shaping and enforcing those legal requirements. Absent such active participation by nanotechnology professionals, decisions regarding development and enforcement of legal requirements that have a profound impact on nanotechnology development will be left to the legal and business communities. Those communities, acting alone, are not in a position to ensure that an effective balance is struck between encouraging nanotechnology advances and protecting the public interest. Thus continuing advances in nanotechnology research and expansion of commercial applications for that research require effective participation by nanotechnology professionals in the legal environment that surrounds nanotechnology.